

haps four or five *Dentalia* have been impaled on the teeth of the spear. It is a very ingenious mode of procuring them, for it would be quite impracticable either to dredge or net them out; and they are never, as far as I know, found between tide-marks.

At one period, perhaps a remote one, in the history of the inland Indians these *Dentalia* were worn as ornaments. I have often found them mixed with stone beads and small bits of the nacre of the *Haliotis*, of an irregular shape, but with a small hole drilled through each piece, in the old graves about Walla-walla and Colville. In all probability, these ornaments were traded from the coast Indians; but, as these graves were quite a thousand miles from the sea, it is pretty clear the inland and coast Indians must have had some means of communication.

March 22, 1864.

Dr. J. E. Gray, F.R.S., in the Chair.

The Secretary called the attention of the Meeting to some recent important additions to the Society's Menagerie. These consisted, first, of a selection from a large importation of living animals lately received by a London dealer from Para, amongst which were the following species:—

A female Monkey of the genus *Pithecia*, probably referable to *Pithecia satanas*, Hoffm. This rather scarce Monkey from the Upper Amazon had not been previously represented in the Society's living collection for many years. The present specimen was nearly black, but with a decided brownish tinge on the back.

2. A Red-throated Falcon (*Hypotriorchis rufifularis*).
3. Two Blue-bearded Crows (*Cyanocorax cyanopogon*).
4. Four Ground-Cuckoos (*Guira piririgua*).
5. One Green Trumpeter (*Psophia viridis*, Spix).
6. One Green Bittern (*Butorides virescens*).
7. Crimson-billed Teal (*Querquedula ipecutiri*, Vieill.).
8. Two Red-billed Whistling-Ducks (*Dendrocygna autumnalis*).
9. An immature specimen of the American Jabiru (*Mycteria americana*).
10. Two young Maguari Storks (*Ciconia maguari*).
11. Two Cassiques (*Cassicus persicus*), together with several other birds of less interest.

A second important arrival had taken place on the 17th ultimo, in the shape of a new present from the Society's Corresponding

Member the Babu Rajendra Mullick, of Calcutta, of the following living animals :—

Eleven Shawl-Goats of the diminutive Cashmere breed, which was believed not to have been previously introduced into this country. .

Four Rufous-tailed Pheasants (*Euplocamus erythrophthalmus*), one male and two females.

One pair of Crowned Pigeons (*Goura coronata*).

Three Nicobar Pigeons (*Caloenas nicobarica*).

Ten Green-winged Doves (*Chalcophaps indica*).

Five Barred Turtledoves (*Geopelia striata*).

Six Dwarf Turtledoves (*Turtur humilis*).

Two Indian Turtledoves (*Turtur gelastes*).

Four Porphyrios (*Porphyrio smaragnotus*).

Five Bengal Chikor Partridges (*Perdix gularis*).

Four Francolins (*Francolinus vulgaris*).

Two Indian Grey Partridges (*Perdix ponticeriana*).

These birds had been safely transmitted to this country by the Overland Mail, under arrangements concluded by the Council with J. J. Stone, Esq.

Mr. Leadbeater exhibited a series of antlers of the Cariboo Reindeer of North America (*Tarandus rangifer*), which had been presented to H. R. H. the Prince of Wales during his travels in Canada.

The following papers were read :—

1. NOTES ON THE DIDUNCULUS STRIGIROSTRIS, OR TOOTH-BILLED PIGEON. BY DR. GEORGE BENNETT.

Having fortunately obtained by purchase a living pair of those singular and rare birds, the Tooth-billed Pigeon (*Didunculus strigirostris*), which had been brought from the Samoan or Navigators' Islands to Sydney, New South Wales, an opportunity has been afforded to me of attentively watching their habits in captivity. To guard against the event also of these valuable birds dying, I availed myself of the services of Mr. C. Thomas, who made an accurate drawing of them from life in their most natural attitudes ; and his drawing conveys an excellent idea of the peculiar expression of these remarkable birds when alive. I have sent a tracing of this drawing for insertion in the 'Illustrated London News ;' and should the bird now on its way to England die, I shall be able to send the Society an accurate coloured representation of the living birds. The *Didunculus*, like the Dodo, has a very limited range, having only been found inhabiting the Samoan or Navigators' Islands. In the contour of the bill, the form and position of the nostrils, and several other characters, the *Didunculus* differs from any other living species at present known ; and, although a smaller bird in size, it approximates the nearest in all its characters to the extinct Dodo, and, like it, combines the character of a rapacious bird with that of the harmless Pigeon.

The Dodo also inhabited a very limited space of land, as the remains of that bird and allied genera have only been found on the small islands of the Mauritius, Bourbon, and Rodriguez. The *Didunculus* may therefore be regarded as the nearest living ally of the extinct Dodo. Although the mandibles of the *Didunculus* are powerful in structure, yet the beak is never used as an offensive weapon; for when the hand is placed in the cage, or the bird is seized for removal from one cage to another, it never attempts to bite the aggressor, but, on the contrary, is so timid, that after fluttering about or running into a dark corner of the cage in its efforts to escape, it soon becomes subdued and is easily taken.

In all the families of Pigeons a diversity in the form of the beak is found. In the Fruit-eating Pigeon the beak is stronger, stouter, and the corneous portion is strongly arched and compressed, bearing a great resemblance to the structure in certain rapacious birds; and this form of beak is carried to the greatest extent in the *Didunculus*, yet the living birds in captivity were never observed to crush hard seeds or nuts. They would nibble into minute bits the seeds of loquats, almonds, and hemp-seed, with the same action as observed in the Parrot tribe when feeding. When I first had the birds, boiled potatoes and stale bread formed their diet. The boiled potatoes were torn and swallowed in large pieces at a time, being soft; but the stale bread they would place their feet upon and tear with the hooked beak into small bits. A piece of apple was also eaten; but the bananas placed in the cage were never touched, although it is said that in a wild state they live on berries, and are very fond of the mountain-plantain. Both the birds were regularly fed twice daily—early in the morning and about four in the afternoon. It was supposed at one time that these birds did not drink water; but I soon found that this assertion was incorrect.

It was early in June 1863 that the first *Didunculus* arrived at Sydney; and on the 15th of that month and following days I examined the bird, which I found in good health, very timid, and a young bird in immature plumage, and the teeth of the lower mandibles not yet developed. It was about the size of the Nicobar Pigeon, but rounder and more plump in form. It kept steadily looking at me during the time I was examining it, uttering occasionally a plaintive *coo, coo, coo*, or *goo, goo, goo*. This bird had been captured on the island of Upolu, not more than five miles from the settlement of Apia, by a native. It has now been in captivity for some time, and is considered to be at this time (January 1864) two years old. It has attained the full plumage of the adult bird, and the teeth of the lower mandibles are also fully developed. When any one approaches the cage, it will sometimes retire to an obscure corner, and at other times will remain quiet on the perch, watching attentively every movement of the spectator, and occasionally changing its position. It invariably feeds in the light, but will not do so if any one is present; the only opportunity we had of observing its mode of feeding was through the window, when the bird was placed in the verandah of the house, when we could watch its actions with-

out being seen by the bird. It usually kept on the low perch, but when disturbed would sometimes jump on the ground, run rapidly about, and then take refuge in the darkest part of the cage. In its physiognomy it is a stupid-looking bird, with, at the same time, a remarkable peculiarity of expression, which the artist has succeeded in obtaining. The bird has nothing particular in its plumage to attract the attention of the common observer; but the head of a rapacious bird on the body of a Pigeon would excite the attention of the most ordinary spectator. The plumage of this bird is of a chocolate-red colour, deeper on the back, tail, and the primaries and secondaries of the wings, and barred over the breast, throat, and wing-coverts with light brown. The upper part of the head is rather bare of feathers, but those remaining are of a dark slate-colour. The base of the beak is of an orange-red, and the rest of the mandibles yellowish. The legs and feet are of a bright orange-red. The cere round the eyes is of a flesh-colour. The irides are of a dark reddish brown. The form of the beak and the bright eyes impart to the bird very much the character of a rapacious bird. The above is the state of the plumage in the young bird.

On the 24th of July another *Didunculus* was brought to Sydney from the Island of Savaii (one of the largest and most mountainous of the Navigators' group). I found it was a full-grown bird in adult plumage, with the teeth of the lower mandibles well developed; the head, neck, breast, and upper part of the back was of a greenish black; back, wings, tail, and under tail-coverts of a chocolate-red. The legs and feet were of a bright scarlet. The mandibles are of a bright orange-red, shaded off near the tip with very light yellow. The cere around the eyes is also of a bright orange-red colour; the irides brownish black. I was informed that these birds are nearly extinct, from having been formerly eaten by the natives in great numbers, and of late years from being destroyed by wild cats; and it is said that most of the Ground-Pigeons are following the fate of the *Didunculus* from the same causes. Indeed, from my observation of the living birds, they are very timid and stupid. On the following day I examined the birds together. They are both moulting; and the young bird has grown very much since I last saw it, and is now larger in size than the adult specimen recently arrived. As there is no sexual distinction in the plumage, it is probable that size may be a distinguishing mark of the sexes; and if so, these birds may prove to be male and female. On the 21st of August I completed my purchase of these birds for a very high price. I must thank the Council of the Acclimatization Societies of Sydney and Melbourne for the liberal resolutions passed by them to unite with me in the purchase of these rare birds, on account of the very high sum demanded for them, and to join with me in presenting them to the Zoological Society of London; but, on mature reflection, considering the casualties to which they would be liable, I considered it would be more satisfactory to take upon myself the sole responsibility and expense. The adult bird often runs wildly about the cage, flapping its wings, and, when the door is open to receive food, makes every

effort to escape. These birds run with great rapidity, elongating the body and depressing the head, and in the action of running resemble the Grouse. On the 12th of September the older bird refused food, which continued to the morning of the 14th of September, when several fits carried it off in the course of the day. I placed the bird entire in spirits, to enable a complete anatomical description of this bird to be given by my distinguished friend Professor Owen. The young bird seems tamer and more lively since the death of its companion; it is probable the old bird being so wild terrified it. I observed a quantity of white powder (epithelium) about the cage lately, and also discolouring the water; it resembled the same kind of powder often observed from the White Cockatoos. On the 4th of October the bird did not feed well; so we gave it some loquats (*Eriobotrya japonica*), a fruit naturalized and abundant in New South Wales. The bird enjoyed the change; it did not devour the pulp, but picked out the seeds, and cracked them into minute bits; what portion was eaten I could not ascertain, but a pint of loquats was used daily in this way, as well as occasionally a little boiled potato. On the 7th of October the *Didunculus* was in excellent health, and the plumage is very much changed, as the head, neck, and breast is now of a slate-colour tinged with dark bottle-green. The bill has become of a bright orange-red, and the legs are nearly a bright scarlet colour: the bird has evidently assumed the adult plumage. When the bird is seen, and does not perceive the observer, it leaps from the perch, runs about the cage, and then commences feeding; but on a visitor approaching, it again takes to the perch, and remains watching the intruder, giving deep guttural growls, followed afterwards by a vibration of the whole body from the head to the tail, uttering at the same time its plaintive notes of *goo, goo, goo*, repeated in quick succession. On the 23rd of October, the bird looks well; it has not eaten for the last two days, but has taken a large quantity of gravel. We find the bird requires a large supply of that material for the purpose of aiding digestion. As it was considered the loquat-seeds might have disagreed with the bird, they were discontinued. On the 25th it appeared worse; and fearing it might die, I placed it in a Parrot-cage to enable the artist to finish the drawing from life, as in a cage of that description he could have a good view of the plumage, &c., over every part of the bird; when, to our great surprise, it jumped from the perch to the bottom of the cage and commenced eating what, on examination, was found to be hemp-seed; and from that time it has been fed on that kind of food. It soon regained its usual health, the diet of hemp-seed being occasionally diversified by some bleached almonds; stale bread is also placed in the cage, but it eats but very little, if any, of it. This circumstance points out the difficulty of arranging a diet for a bird with whose habits we are unacquainted, as at one time it thrives well upon a certain diet, on a sudden appears to be dying, and then becomes in good health from a change of food accidentally discovered, as in this instance. Since then, the *Didunculus* has continued in most excellent health; and has now just been placed on board the ship 'La Hogue,' Captain



J Wolf, del. et lith

M & N Hanhart Imp

SMITHORNIS RUFO-LATERALIS

Williams, under the care of Mr. Broughton, the steward, from whose experience in the management of birds there is every chance of this rare bird arriving safe at its destination in the Gardens of the Zoological Society in the Regent's Park. The 'La Hogue' sailed from Sydney early on the morning of the 12th of January, 1864.

The whole of the time the bird was in my possession it never became domesticated, nor evinced the slightest attachment to the lady who daily fed it: it was the same to her as to strangers; and I do not consider the *Didunculus* a bird that will be readily domesticated or reconciled to captivity. For some period of time this bird would be very tame comparatively, and then, without any apparent cause to account for the change, would become very wild. At that time the cleaning of the cage was attended with some difficulty, from its violent fluttering on any one approaching for the purpose, in which it evinced no little power of wing.

2. ON A NEW SPECIES OF SMITHORNIS. BY GEORGE ROBERT GRAY, F.L.S., ETC.

(Plate XVI.)

I beg to call the attention of the Society to a new species of bird belonging to the interesting genus *Smithornis*, which was established by the late Prince Bonaparte on the *Platyrhynchus capensis* of Sir A. Smith.

It is characterized as follows, under the name of

SMITHORNIS RUFOLATERALIS, sp. nov. (Pl. XVI.)

Head and occiput deep black; lores white; nape with a narrow collar of orange-brown; back black, varied with white and orange-brown; scapulars and upper tail-coverts orange-brown; wing-coverts black, tipped with white; beneath the body white, but with the breast and sides of abdomen more or less streaked with narrow stripes of black along the shaft of each feather; each side of the breast with a patch of pale rusty colour. Upper mandible black, lower one yellow; feet pale horn-colour.

Length 4" 6''; wings 2" 4''.

This bird differs from the typical and only hitherto known species *Smithornis capensis* (Smith) in being of a smaller size, and in possessing a greater variety of colours.

The British Museum possesses, through Mr. Gould, a single specimen of *S. rufolateralis*, which was stated to have been brought from West Africa; but the exact locality is unknown.

3. REPORT OF A COLLECTION OF FISHES MADE BY MESSRS. DOW, GODMAN, AND SALVIN IN GUATEMALA. BY ALBERT GÜNTHER, M.A., M.D., PH.D., F.Z.S.

Part First.

The following paper contains a report on a collection of fishes made by Messrs. Salvin and Godman during their travels in Guatemala and in adjacent countries, in which they were assisted by Capt. Dow, a gentleman whose name is already familiar to all interested in ichthyology. I give at present diagnoses of those new species which are not included in the third, fourth, and fifth volumes of the 'Catalogue of Fishes.' Full descriptions, with notes on the localities where the collections have been made, and with a complete list of the species collected, will be published in the 'Transactions' of this Society.

CENTROPOMUS MEDIUS.

A. 3/7. L. lat. 57. Eight longitudinal series of scales between the origin of the second dorsal fin and the lateral line. The height of the body is contained thrice and three-fourths in the total length (without caudal); the length of the head twice and four-fifths. Præorbital finely serrated; suboperculum produced into a flap, which does not extend to the vertical from the origin of the dorsal fin. The intermaxillary extends somewhat beyond the anterior margin of the orbit. Dorsal spines strong; the third is longer than the fourth, and half as long as the head. The second anal spine long, but a little shorter than the third, and equal in length to the distance between the extremity of the upper jaw and the præopercular margin. The length of the ventral fin is much more than one-half of its distance from the anal fin. Lateral line black.

Two specimens, 13 inches long, from Chiapam.

CENTROPOMUS NIGRESCENS.

A. 3/6. L. lat. 70. Ten longitudinal series of scales between the origin of the second dorsal fin and the lateral line. The height of the body is contained four times and a half in the total length (without caudal); the length of the head twice and four-fifths. Præorbital not serrated; suboperculum produced into a short flap, which does not extend to the vertical from the origin of the dorsal fin. The intermaxillary extends a little beyond the middle of the orbit. Dorsal spines rather feeble; the third and fourth are equal in length, two-fifths of the length of the head; the second and third anal spines also are equal in length, and not longer than the dorsal spines mentioned. The length of the ventral fin is scarcely more than one-half of the distance of its base from the anal. Air-bladder without appendages anteriorly. Silvery; upper parts and fins blackish; lateral line black.

One specimen, 14 inches long, from Chiapam.

This species is allied to *C. appendiculatus*, Poey, but differs externally in its considerably more feeble and shorter fin-spines.

We take here the opportunity of describing another species of this genus, the typical specimen of which is in the British Museum.

CENTROPOMUS BREVIS.

A. $\frac{3}{6}$. L. lat. 50. Eight longitudinal series of scales between the origin of the second dorsal fin and the lateral line. The height of the body is two-sevenths of the total length (without caudal); the length of the head two-fifths. Præorbital strongly serrated; suboperculum produced into a long flap, which extends beyond the vertical from the origin of the dorsal fin. The intermaxillary extends to below the middle of the orbit. Dorsal spines strong; the third is scarcely longer than the fourth, its length being equal to the distance between the hinder margin of the orbit and the extremity of the lower jaw. The second anal spine is very long, considerably longer than the third, and two-thirds of the length of the head; if laid backwards, it extends beyond the root of the caudal. The length of the ventral fin is two-thirds of the distance of its base from the origin of the anal. Vent much nearer to the anal than to the ventral. Lateral line greyish.

We have only one specimen, 6 inches long, of this species; we do not know from what part of Tropical America it comes.

CENTROPRISTIS MACROPOMA.

D. $\frac{10}{13}$. A. $\frac{3}{7}$. L. lat. 52. L. transv. 6/16.

Closely allied to *C. radialis*, Q. & G.; but whilst that species has a notch above the spiuiferous angle, the present has its præopercular margin not interrupted, the long spines of the angle gradually passing into the finer serrature. There are six series of scales between the eye and the angle of the præoperculum. The maxillary extends nearly to the vertical from the posterior margin of the orbit. Dorsal fin with a notch, the ninth spine being considerably shorter than the tenth. A series of rather small brownish spots above and below the lateral line.

Three specimens were collected by Messrs. Dow and Salvin on the Pacific coast of Panama.

MESOPRION ARATUS.

D. $\frac{11}{13}$. A. $\frac{3}{8}$. L. lat. 45. L. transv. 4/12.

The height of the body equals the length of the head, and is contained thrice and two-fifths in the total (without caudal). The maxillary does not extend backwards to the vertical from the centre of the eye. Præoperculum finely serrated, with scarcely a trace of a posterior notch. Dorsal spines of moderate strength; the third and fourth are the longest, two-fifths of the length of the head; the eleventh is scarcely longer than the tenth, which is rather more than half as long as the fourth. Caudal fin emarginate, two-thirds scaly; anal spines short, rather feeble, the third longer than the second, and equal in length to the last dorsal spine. Upper and lateral parts

brownish olive, each scale with a pearl-coloured spot, the spots forming together very distinct longitudinal stripes; no black lateral spot; hind part of the root of the pectoral brown. Lower parts salmon-coloured.

We have four examples: two, 15 inches long, were collected by Mr. Salvin at Chiapam; and two young ones were sent by Capt. Dow from the Pacific coast of Panama.

PRISTIPOMA CHALCEUM.

D. $\frac{12}{15}$. A. $\frac{3}{12}$. L. lat. 56. L. transv. 11/19.

The height of the body is contained twice and two-thirds in the total length (without caudal); the length of the head thrice and a third. The diameter of the eye is nearly equal to the width of the interorbital space, and two-thirds of the extent of the snout. The maxillary does not extend backwards to the vertical from the anterior margin of the orbit. Præoperculum minutely serrated behind, with the angle rounded, but not produced. There is no notch between the spinous and soft portions of the dorsal fin, the hinder spines being only a little shorter than the anterior rays; dorsal spines of moderate strength, the fourth being the longest, not quite half as long as the head; anal spines short, the second being only a little longer than the third, two-sevenths of the length of the head. Caudal fin subtruncated, scarcely emarginate. Dorsal and anal perfectly scaleless. The pectoral fin extends to the vertical from the vent. Bronze-coloured, shining silvery, perfectly immaculate; vertical fins blackish, with an indistinct light band along the base.

One specimen, 8 inches long, was discovered by Messrs. Dow and Salvin on the Pacific coast of Panama.

PRISTIPOMA MACRACANTHUM.

D. $11\frac{1}{13}$. A. $\frac{3}{8}$. L. lat. 47. L. transv. 6/13.

The height of the body equals the length of the head, and is one-third of the total (without caudal). The diameter of the eye equals the width of the interorbital space, and is two-thirds, or somewhat less than two-thirds, of the extent of the snout. Hind margin of the anterior nostril with a broad flap. Snout somewhat produced; the maxillary does not extend to below the anterior margin of the eye. Præoperculum with the hind margin rather concave, and with stronger teeth at the angle, which is rounded. The spinous and soft portions of the dorsal fin are separated by a deep notch, the spine of the soft portion being much longer than the preceding, which is somewhat longer than the second. Dorsal and anal spines exceedingly strong; the fourth dorsal spine is the longest, its length being contained twice and a third in that of the head. The second anal spine much longer and stronger than the third, and even than the fourth dorsal spine. Caudal fin truncated. Each soft ray of the vertical fins is accompanied by a series of minute scales. The pectoral fin extends to the vent. Scales smooth. Silvery, with several

very indistinct dark cross bands on the back, which appear to be arranged as in *P. leuciscus*.

Two specimens, 11 and 14 inches long, were collected by Mr. Salvin at Chiapam.

PRISTIPOMA LEUCISCUS.

D. $11\frac{1}{15}$. A. 3/7-8. L. lat. 51. L. transv. $\frac{5-6}{10}$.

The height of the body is contained thrice or thrice and a third in the total length (without caudal), the length of the head thrice and a fourth. The diameter of the eye is equal to, or more than, the width of the interorbital space, but less than the extent of the snout. The maxillary does not quite extend backwards to the vertical from the anterior margin of the orbit. Præoperculum finely serrated behind, with the angle rounded, and with the hind margin slightly curved. The spinous and soft portions of the dorsal fin are separated by a deep notch, the spine of the soft portion being nearly twice as long as the preceding. Dorsal spines long, of moderate strength: the third is the longest, and one-half, or more than one-half, as long as the head. Anal spines rather strong: the third is a little longer than the second, equal to the seventh dorsal spine, and more than one-third of the length of the head. Caudal fin emarginate. Each soft ray of the vertical fins is accompanied by a series of minute scales. The pectoral fin extends to the vertical from the origin of the anal in the younger example, but is shorter in adult ones. Scales smooth, bright silvery; young specimens with several very indistinct dark cross bands on the back, the first from the nape of the neck to the gill-opening, the second below the seventh dorsal spine, the third below the last dorsal spine; old specimens with the marginal membrane of the operculum black.

One specimen, $7\frac{1}{2}$ inches long, was found by Mr. Salvin at San José. Three others, from 11 to 12 inches long, are from Chiapam.

CONODON PACIFICI.

D. $11\frac{1}{13}$. A. $\frac{3}{10}$. L. lat. 47. L. transv. 7/13.

The spinous teeth at the angle of the præoperculum are not much stronger than the others. The height of the body is contained twice and two-fifths in the total length (without caudal).

One specimen, $12\frac{1}{2}$ inches long, was collected by Mr. Salvin at Chiapam.

HÆMULON MARGARITIFERUM.

D. $\frac{12}{17}$. A. $\frac{3}{11}$. L. lat. 55. L. transv. 6/15.

The height of the body is one-third of the total length (without caudal), the length of the head two-sevenths. The diameter of the eye is two-sevenths of the latter, and equal to the extent of the snout and to the width of the interorbital space, which is very convex. The maxillary extends beyond the vertical from the anterior margin of the eye. Præoperculum emarginate behind. Dorsal fin scarcely

notched, with the soft portion very low; its spines are moderately strong, the fourth is the longest, not quite half as long as the head. Anal spines strong; the second is longer and stronger than the third, and equal to the eighth of the dorsal. The soft vertical fins enveloped in scales; caudal forked, with the upper lobe longest. The pectoral fin does not extend to the vent. Greenish olive above, each scale with a pearl-coloured centre; sides silvery; a blackish spot above in the axil.

One specimen, 12 inches long, was obtained by Messrs. Dow and Salvin on the Pacific coast of Panama.

UPENEUS TETRASPILUS.

D. 8|9. A. 7. L. lat. 33. L. transv. 2/6.

The height of the body equals the length of the head, and is contained thrice and two-fifths in the total (without caudal); the width of the interorbital space is two-thirds of the length of the snout. Teeth in both jaws in two series, the outer series of the upper jaw being formed by very obtuse and partly confluent teeth. The maxillary is dilated and rounded behind, and bent upwards into a sort of hook; the barbels extend to the vertical from the root of the pectoral. The third and fourth dorsal spines are subequal in length, longer than the second, and nearly three-fourths of the length of the head. Greenish olive above, each scale above and below the lateral line with a large pearl-coloured spot; sides yellow; a rose-coloured band on each side of the belly. A large blackish blotch on the lateral line, behind the hind part of the spinous dorsal fin. A second smaller blackish spot behind the orbit; the latter is sometimes very indistinct.

Two specimens, $8\frac{1}{2}$ inches long, were collected by Messrs. Dow and Salvin on the Pacific coast of Panama.

This species would belong to the division which has been called *Mulloides*.

POLYNEMUS MELANOPOMA.

D. $7\frac{1}{12}$. A. $\frac{2}{13}$. L. lat. 73.

Nine free pectoral appendages, the longest of which extends to the vent. Præoperculum finely serrated, with a small spine above the angle. The vomerine teeth form a rounded patch; the band of palatine teeth is as broad anteriorly as the front part of the intermaxillary band. Operculum black.

A single specimen, 15 inches long, was obtained by Mr. Salvin at San José.

UMBRINA ELONGATA.

D. $10\frac{1}{24}$. A. 1/7. L. lat. 70. L. transv. 7/22.

The height of the body is contained four times and a third in the total length without caudal, and five times if the caudal is included; the length of the head is two-sevenths of the total, or one-fourth if

the caudal is included. The depth of the head is contained once and three-fourths in its length. Snout long; the diameter of the eye is two-fifths of the length of the snout, and one-fourth of the postorbital part of the head. Symphysial barbel very short, as long as the posterior nostril. Præoperculum without distinct serrature. The length of the second dorsal spine is one-half of that of the head. Posterior margin of the caudal *f*-shaped, the upper lobe being pointed, the lower rounded; anal spine very feeble. The maxillary extends to the vertical from the anterior margin of the orbit. Upper parts blackish, shining silvery, the lower white.

One specimen, 17 inches long, was found by Mr. Salvin at Chiapam.

MICROPOGON ALTIPINNIS.

D. $10\frac{1}{22}$. A. 2/7. L. lat. 48-50. L. transv. 7/15.

The height of the body is contained thrice and two-thirds in the total length (without caudal); the length of the head thrice and a half. The maxillary extends scarcely beyond the vertical from the anterior margin of the eye. A series of five minute barbels along each side of the mental groove. Two short, strong, divergent spines at the angle of the præoperculum. The third and fourth dorsal spines are long, their length being three-fifths of that of the head; anal spine of moderate strength, not quite one-fourth of the length of the head. Nearly uniform silvery.

Two specimens were procured by Mr. Salvin—one, 17 inches long, at Chiapam, and another, 14 inches long, at San José.

OTOLITHUS ALBUS.

D. $10\frac{1}{21}$. A. 2/9.

Scales rather irregularly arranged; there are seven series between the origin of the dorsal fin and the lateral line. The height of the body is one-fourth of the total length (without caudal), the length of the head two-sevenths. The extent of the snout is one-fourth of the length of the head; the maxillary extends somewhat beyond the vertical from the posterior margin of the eye. Præopercular angle not produced behind. The spinous dorsal is much longer than high; its spines are feeble, the length of the fourth being two-fifths of that of the head. Caudal fin rounded, with the middle rays produced. The second anal spine is truly spinous, not flexible, two-fifths of the length of the first soft ray. The pectoral fin extends as far backwards as the ventral, being more than half as long as the head. Immaculate, silvery, back greenish. (Pseudobranchiæ present.)

One specimen, $14\frac{1}{2}$ inches long, was obtained by Mr. Salvin at Chiapam.

OTOLITHUS RETICULATUS.

D. $10\frac{1}{26-27}$. A. 11(2/9).

Closely allied to *O. carolinensis*. Scales rather irregularly ar-

ranged; there are nine series between the origin of the dorsal fin and the lateral line. The height of the body is contained four times and a third in the total length (without caudal); the length of the head thrice and a third. The extent of the snout is two-sevenths of the length of the head; the maxillary does not extend backwards to the vertical from the posterior margin of the eye; præopercular angle somewhat produced behind, membranaceous, striated; the posterior margin of the præoperculum obliquely descending backwards. The spinous dorsal is much longer than high; its spines are feeble, the fourth being the longest, two-fifths of the length of the head. Caudal fin subtruncated, the middle rays somewhat produced. The first anal ray is quite rudimentary; the second as long as the eye, flexible, scarcely spinous. The pectoral fin extends as far backwards as the ventral, being more than half as long as the head. Back and sides with an irregular network of brown undulated streaks; fins immaculate.

Two specimens were collected by Mr. Salvin—one, 15 inches long, at San José, the other, 13 inches long, at Chiapam.

TRACHYNOTUS GLAUROIDES.

D. $6\frac{1}{20}$. A. $2\frac{1}{18}$.

Closely allied to *T. glaucus*, but with the body more elevated. The height of the body is one-half of the total length (without caudal); the length of the head two-sevenths. The maxillary extends to below the middle of the eye. Anterior dorsal and anterior anal rays, and the caudal lobes, much prolonged, the length of the latter being two-sevenths of the total. The *ventral fin does not extend to the vent.* Five narrow blackish vertical bars across the lateral line.

One specimen, 7 inches long, was obtained by Mr. Salvin at San José.

Mr. Gill (Proc. Acad. Nat. Sc. Philad. 1863, p. 86) describes a *Trachynotus fasciatus*, which he distinguishes by its colours. "The second vertical band between the fourth and fifth (spines), and the third under the fourth and fifth rays." If the distribution of the bands is a specific character, that species cannot be identical with ours, which has the second band under the third spine, and the third immediately in front of the spine of the soft dorsal fin.

THALASSOPHRYNE RETICULATA.

D. $2\frac{1}{24}$. A. 24. V. $1\frac{1}{2}$. P. 16.

The length of the head is two-sevenths of the total length (without caudal). The teeth on the palate are in a single series, very short, obtuse, incisor-like. Pectoral very large, extending backwards to the sixth anal ray. Head, body, and fins brown, with a network of yellowish lines; vertical and pectoral fins with a white margin.

In other respects this species agrees with *T. maculosa*; so that we may refer to the description of that species given in 'Catal. Fish.' iii. p. 175. One specimen has been found by Messrs. Dow and Salvin on the Pacific coast of Panama; it is $10\frac{1}{2}$ inches long.

ANTENNARIUS LEOPARDINUS.

D. 3|13. A. 7. P. 11.

Skin very rough, covered with minute spines; anterior dorsal spine (tentacle) not longer than the second, terminating in a small, flat disk; the third is separate from the soft dorsal. Brownish grey, marbled with rose-colour, and with brown dots on the sides; a black ocellus edged with rosy in the middle of the side, another larger one on the base of the ninth and tenth dorsal rays, and one or two small ones on the side of the tail. Belly covered with round brown spots; caudal with ovate black spots, arranged in three transverse series; all the other fins with similar spots.

One specimen, $2\frac{1}{2}$ inches long, was found by Capt. Dow on the Pacific coast of Panama, and presented to Mr. Salvin.

ELEOTRIS LONGICEPS.

D. 6 | $\frac{1}{10}$. A. $\frac{1}{10}$. L. lat. 66.

Vomerine teeth in a broad subcrescentic band, which is more than half as broad as that of the intermaxillaries. Thirty-six series of scales between the occiput and the anterior dorsal fin; twenty between the origin of the posterior and the anal. The height of the body is nearly one-half of the length of the head, which is more than one-third of the total (without caudal). The maxillary extends to below the middle of the eye; teeth cardiform. Caudal fin obtusely rounded, one-sixth of the total length. Brownish black, marbled with brown and black; fins with roundish blackish spots.

This species differs from the others, which have been referred to the division of *Philypnus*, in having a comparatively longer head. One specimen, 8 inches long, was given to Mr. Salvin by Capt. Dow, who found it in the Lake of Nicaragua.

AMBLYOPUS BREVIS.

D. 21. A. 15. The height of the body is one-eighth of the total length (without caudal); the length of the head two-ninths. Eyes minute. Lower jaw with a series of longish, widely set teeth. Caudal fin black.

One specimen, 3 inches long, was found on the Pacific coast of Panama by Messrs. Dow and Salvin.

ATHERINICHTHYS GUATEMALENSIS.

D. 4 | $\frac{1}{9}$. A. $\frac{1}{22}$. L. lat. 36. L. transv. 7.

Anterior dorsal fin very small, inserted behind the vertical from the commencement of the anal fin. The height of the body is contained five times in the total length (without caudal); the length of the head four times and a fourth. The silvery band occupies the third upper series of scales. The lower caudal lobe rather longer than the upper.

Several examples, from 2 to $2\frac{1}{2}$ inches long, were collected by Mr. Salvin in the Lakes of Huamuchal.

GERRES AXILLARIS.

D. 9|10. A. 3/8. L. lat. 34. L. transv. 5/10.

Allied to *G. plumieri*, but with considerably shorter fin-spines. The height of the body is contained twice and a fourth in the total length (without caudal). Præorbital finely serrated. Snout as long as the eye; the groove for the intermaxillary processes is very broad, scaleless, extending backwards to the vertical from the centre of the eye. Dorsal fin notched, the last spine being not much longer than the eye; dorsal spines strong, the second as long as the head without snout; the second anal spine stronger, but scarcely longer than the second of the dorsal fin. The pectoral extends to the vertical from the third anal spine. Caudal deeply forked, with the lobes equal in length to each other and to the pectoral. A blackish streak along each series of scales; the hinder side of the axil, and sometimes the anterior, blackish.

Three specimens, from 8 to 9 inches long, were collected by Mr. Salvin at Chiapam.

GERRES BREVIMANUS.

D. 9|10. A. 3/8. L. lat. 39. L. transv. 6/11.

Præorbital minutely serrated. The height of the body is contained twice and two-fifths in the total length (without caudal); the length of the head twice and a half. Snout as long as the eye; the groove for the intermaxillary processes is broad, scaleless, not extending backwards to the vertical from the centre of the eye. Dorsal fin notched, the last spine being longer than the eye; dorsal spines strong, the length of the second equals the distance between the end of the operculum and the anterior nostril; the second anal spine stronger, but much shorter, than the second of the dorsal fin. The scaly sheath of the anal fin leaves the outer half of the last ray uncovered. The pectoral extends scarcely to the vertical from the vent. Caudal scaly, deeply forked, with the lobes equal in length, each being one-fourth of the total. Three or four blackish streaks along the series of scales below the lateral line; the spinous dorsal fin black.

One specimen, 10 inches long, was found by Mr. Salvin at Chiapam.

HEROS GUTTULATUS.

D. $\frac{17}{13}$. A. $\frac{6}{9}$. L. lat. 33. L. transv. $\frac{4\frac{1}{2}}{12}$.

The fold of the lower lip is interrupted in the middle. The height of the body is contained twice and three-fifths in the total length (without caudal); the length of the head thrice and a fifth. The upper profile of the head descending in a gentle curve. Scales on the cheek in four series. The first dorsal spine is inserted behind the vertical from the upper end of the gill-opening. Dorsal spines rather feeble, the length of the twelfth being two-sevenths of that of the head. Pectoral two-thirds as long as the head. Upper parts blackish, each scale with a black base; lower parts reddish, with a

broad blackish band from behind the pectoral to the base of the caudal; many scales within or below the band with a black spot in the upper or lower angle; each scale on the side of the head with a black spot; chin and throat violet. The spinous dorsal black, with yellowish margin; the soft parts of the vertical fins with blackish spots.

One specimen, 6 inches long, was collected by Mr. Salvin on the Pacific coast of Guatemala.

HEROS MACRACANTHUS.

D. $\frac{14-15}{12-13}$. A. $\frac{5}{9-10}$. L. lat. 31. L. transv. $\frac{5\frac{1}{2}}{15}$.

The lower lip is interrupted in the middle. The height of the body is two-thirds of the total length (without caudal) in adult specimens, but only one-half in immature; the length of the head is one-third of the total. Upper profile of the head very steep, not concave. Scales on the cheek in five series. The first dorsal spine is a little before the vertical from the upper end of the gill-opening. Dorsal and anal spines strong, the tenth of the dorsal fin being two-fifths of the length of the head. Pectoral as long as the head. Dark greenish, many scales with a pearl-coloured spot in the upper or lower angle. Vertical and ventral fins black. Immature specimens with six very indistinct dark cross bands, the third of which has a blackish blotch below the lateral line; an indistinct blackish spot at the root of the caudal fin.

About a dozen specimens, from 3 to 9 inches long, were collected by Mr. Salvin at Chiapam and Huamuchal.

HEROS CITRINELLUS.

D. $\frac{16-17}{12}$. A. $\frac{7}{8-9}$. L. lat. 30. L. transv. 6/13.

The fold of the lower lip is continuous in the middle. The height of the body is contained twice and a fifth in the total length (without caudal); the length of the head twice and seven-eighths; nape of the neck very convex; interorbital space broad, its width being two-fifths of the length of the head. Snout not obtuse; scales on the cheek in four series. The first dorsal spine is inserted above the upper end of the gill-opening. Dorsal and anal spines slender, the tenth of the dorsal fin being two-fifths of the length of the head. Pectoral nearly as long as the head. Lemon-coloured, either nearly uniform or with the back black, which colour sometimes forms irregular blotches on the vertical fins.

Three specimens, from 7 to 8 inches long, were collected by Capt. Dow in the Lake of Nicaragua.

HEROS NICARAGUENSIS.

D. $\frac{19}{11}$. A. $\frac{7}{9}$. L. lat. 35. L. transv. 5/13.

The fold of the lower lip is interrupted in the middle. The height of the body is contained twice and two-fifths in the total length

(without caudal); the length of the head twice and one-fifth. Head much higher than long, in consequence of an adipose swelling above the eye, which renders the shape of the head Coryphæna-like. Scales on the cheek in six series, rather irregularly arranged. The first dorsal spine is inserted above the upper end of the gill-opening. Dorsal and anal spines slender, the sixteenth of the dorsal fin being one-half of the length of the head. Pectoral not quite as long as the head. Brownish olive above, yellowish below; back with five black cross bands, not extending downwards to beyond the middle of the side; many scales with a brown vertical marginal streak. The soft vertical fins with brown spots.

One specimen, $6\frac{1}{2}$ inches long, was collected by Capt. Dow in the Lake of Nicaragua.

HEROS DOVII.

D. $\frac{18}{11-12}$. A. $\frac{6}{9-10}$. L. lat. 35. L. transv. $\frac{5\frac{1}{2}}{13}$.

The fold of the lower lip is continuous in the middle. The height of the body is contained thrice in the total length (without caudal); the length of the head twice and three-fifths. Snout pointed, with the lower jaw very prominent. Both jaws with a pair of fangs, those of the upper pair being close together in the middle of the jaw, whilst the lower are separate. Scales on the cheek small, rather irregularly arranged, in about eight series. The first dorsal spine is inserted behind the vertical from the upper end of the gill-opening. Dorsal and anal spines slender, the length of the twelfth of the dorsal fin being one-fourth of that of the head. Pectoral three-fifths as long as the head. Brown, irregularly marbled with darker; fins black; an indistinct black band along the operculum and the side of the trunk; an oblique blackish band descends from the eye towards the root of the pectoral; a black spot behind the angle of the mouth.

This species is allied to *H. friedrichsthalii*, *H. salvini*, &c. Two specimens, 6 inches long, were collected by Capt. Dow in the Lake of Nicaragua.

HEMIRHOMBUS OVALIS.

D. 86. A. 69. L. lat. 58.

The height of the body is scarcely less than one-half of the total length (without caudal). Interorbital space concave, its width being one-third of the vertical diameter of the eye. Body nearly uniform reddish olive.

One specimen, 7 inches long, was collected by Messrs. Dow and Salvin on the Pacific coast of Panama.

4. ON A POISON-ORGAN IN A GENUS OF BATRACHOID FISHES.
 BY DR. ALBERT GÜNTHER.

Many fishes are known which, provided with long, bony, and sometimes serrated spines, are justly feared on account of the dangerous wounds they inflict. The Sting-Rays, many Siluroids, and some scaly fishes, like the Weevers, are thus armed. Although the effects ascribed to such wounds have doubtless been exaggerated in many cases, natives and fishermen, as well as travellers, agree in the belief that some poison must be communicated. However, with the exception of a single instance, viz. that of the Weevers*, comparative anatomists have never pointed out a trace of an organ secreting or conducting a poisonous substance; and consequently the poisonous nature of the wound has been doubted, the worst cases being explained by the mechanical effect of a serrated spine, by the influence of the climate, or by the peculiarity of the constitution. Thus in all the hand-books of comparative anatomy the presence of a poison-organ in the class of fishes is denied, and even Bleeker† (than whom no naturalist has had better opportunities of observing such fishes during life) expressly says that they were unjustly reputed poisonous.

On the other hand, I have heard of so many positive facts from highly educated travellers and excellent observers (some of whom, being medical men, had treated cases of this nature), that it appeared to me necessary to give every attention to this subject. Especially it seemed probable that a sac with a more or less wide opening in the axil of the pectoral fin of many Siluroid and of some other fishes would contain a fluid which might be introduced into a wound by means of the pectoral spine, which would be covered with it, like the barbed arrow-head of a bushman.

Whether this secretion is equally poisonous in all the species which are provided with that axillary sac is a question which can only be decided by experiments made in the tropics; but I can hardly doubt its poisonous nature, after discovering in a genus of fish a poison-organ which structurally is the same as in the venomous

* Dr. J. E. Gray has directed my attention to a paper by Mr. Byerley, contained in the Proceedings of the Literary and Philosophical Society of Liverpool, No. 5, 1849, p. 156. In this paper Mr. Byerley demonstrates, in the most convincing manner, that the double-grooved opercular and dorsal spines of the Weevers are poison-organs. Although the structure of the spines, with their external grooves, were known to previous writers, it is Mr. Byerley's merit to have shown the presence of a cavity within the substance of the spines which is the proper depository of the poison before its ejection. But, at present, I cannot agree with him that the body found in the cavity and in the groove is a gland; it appears to me that what he considered to be a gland was the poisonous fluid itself, coagulated and hardened by the action of the spirits in which the specimens had been immersed in order to render "the gland more opaque and denser." I formed this opinion from examinations of specimens of *Trachinus draco* as well as of *T. vipera*, which, however, had been in spirits for a considerable period. Nevertheless there is no doubt that the poison-apparatus of *Trachinus* is homologous with that of *Thalassophryne*, only in the latter it is developed to as great a perfection as in the fang of a viper.

† Atl. Ichthyol. Silur. p. 21.

snakes. This genus, belonging to the family of Batrachidæ, was described by me in the Catal. Fish. iii. p. 174, with a single species, *Thalassophryne maculosa*. The typical specimen being small and having been in spirits for a long time, I did not observe the openings in the venom-spines, although I now perceive them to be present, as in the second species found by Messrs. Dow and Salvin, which I have described above (p. 150) as *Thalassophryne reticulata*. The specimen is $10\frac{1}{2}$ inches long.

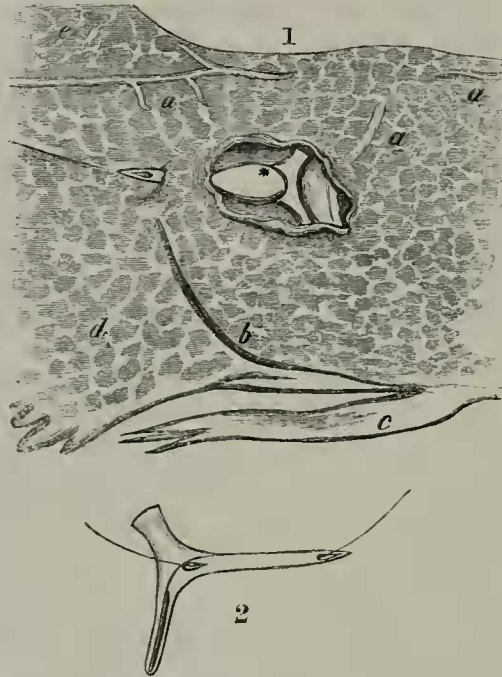


Fig. 1. Hind half of the head, with the venom-sac of the opercular apparatus *in situ*. * Place where the small opening in the sac has been observed. a. Lateral line and its branches. b. Gill-opening. c. Ventral fin. d. Base of pectoral fin. e. Base of dorsal fin.

Fig. 2. Operculum, with the perforated spine.

The structure of the poison-organ is as follows:—

1. *The opercular part.*—The operculum is very narrow, vertically styliform, and very mobile; it is armed behind with a spine, eight lines long, and of the same form as the venom-fang of a snake; it is, however, somewhat less curved, being only slightly bent upwards; it has a longish slit at the outer side of its extremity, which leads into a canal perfectly closed, and running along the whole length of its interior; a bristle introduced into the canal reappears through another opening at the base of the spine, entering into a sac situated on the opercle and along the basal half of the spine; the sac is of an oblong-ovate shape, and about double the size of an oat-grain. Though the specimen had been preserved in spirits for about nine months, it